

## TAILGATE EXTENSION

### CROSS REFERENCE TO RELATED APPLICATION

[0001] This patent application is a continuation in part application claiming priority from United States Patent Application: Tailgate Extension Apparatus, Serial number 10/167,767 filed on June 11, 2002.

### FIELD OF THE INVENTION

[0002] The present invention relates to tailgates for vehicles, and, in particular, it relates to extensions for tailgates which facilitate the carrying of certain types of cargo, or entry into the cargo space.

### BACKGROUND OF THE INVENTION

[0003] As seen in Fig. 1, vehicles 20 such as pick-up trucks, station wagons, sport utility vehicles (SUVs), or other vehicles have cargo spaces 40 that are used for hauling materials. Such a vehicle, typically, has a tailgate 100 that serves as a barrier, thereby retaining the cargo within the bed. Many of these tailgates 100 are hingedly attached to the bed or vehicle frame at the lower portion of the tailgate, and the tailgate 100 can function in a vertical, locked position or a horizontal, open position.

[0004] Oftentimes, however, it is necessary to transport items that do not fit within the standard cargo space available when the tailgate is locked in a vertical position. This problem has been exacerbated in recent years by the influx of smaller vehicles on the

automotive market. As such, a user is required to transport the cargo with the tailgate in an open horizontal position or with the cargo extending beyond the upper edge of a vertical tailgate. In either case, the user is required to take additional steps to manually secure the cargo in the bed. These additional steps may be time-intensive and prone to failure, resulting in the cargo accidentally falling out of the vehicle or becoming damaged.

[0005] Another difficulty frequently encountered when using conventional tailgates concerns entry/exit into and out of the cargo space or truck bed. Although it is desirable to access the inside of a truck bed, conventional open tailgates are too high to be used as a step, especially for people of a lower stature or people carrying items in their arms. As a result, access to cargo beds is often limited since most users cannot step from the ground directly into the cargo bed.

[0006] Thus a common problem with conventional tailgates is that they have inherent size limitations, both because the length of the bed is too short and because the tailgate is situated too far above the ground. As a result, extension devices for tailgates have been proposed, albeit often to address only one of the aforementioned problems. Many of the prior extension devices include pieces that are removably attached to the tailgate or, though permanently attached, are located external to the tailgate itself. Although such devices may be useful, they are frequently cumbersome and are not practical for everyday use since they require time-consuming setup procedures. Also, existing tailgate extensions and step devices may be stored externally when not in use.

Such external storage ultimately takes up a portion of the existing bed space and can also be unsightly. Furthermore, conventional tailgate extensions do not attempt to combine the tailgate extensions and stepping devices into one, easily manipulated and stored unit.

[0007] Thus, there presently exists a need for a combination extension/stepping device that is easy to use, can be compactly stored, is convenient for the user to access, and can be readily set up to extend the working area of a bed and/or to create a step to enhance access to the bed.

## INTRODUCTION TO THE INVENTION

[0008] One presently preferred embodiment of the invention provides a tailgate extension apparatus capable of performing as a backstop, a tailgate extension, and/or a step for use with a conventional cargo area in a vehicle. The tailgate extension generally comprises: a U-frame member including side arms and a step; two side braces; and two hinges. The side braces selectively connect the U-frame member directly to the vehicle tailgate. The hinges allow for rotation of the U-frame member such that the aforementioned positions (backstop, extension, and step) may be realized.

[0009] In at least one preferred embodiment, the tailgate extension apparatus may be stored within the vehicle tailgate and may be extendable by way of a plurality of channels located within the tailgate. These channels are preferably facilitated through the use of a hybrid tailgate that includes a metal skin wrapped around a plastic reinforcing module.

[0010] The side arms of the U-frame member, preferably, contain recesses in which the braces may be stored when the extension member is in its stored position inside the vehicle tailgate. In this way, the U-frame member, the braces, and the hinges may all be stored within the tailgate and are not visible from the outside of the vehicle, and are not stored in the cargo space of the vehicle.

[0011] The invention also comprises methods for removing and locking the tailgate extension apparatus into various useful positions. To use the tailgate extension apparatus, the user may unlatch and lower the vehicle tailgate, release and extend the U-frame member, and rotate and lock the U-frame member into a final usable position. The side braces may be removed from the tailgate extension apparatus by extracting the braces laterally from the side recesses of the arms of the U-frame member. These side braces may then be used to lock the extension at an appropriate angle to the tailgate using conventional tailgate latches. Preferably, the tailgate extension apparatus may be locked in various positions to create a backstop, extension or step.

[0012] It is to be understood that both the foregoing general description and the following detailed description are exemplary and explanatory only and are not restrictive of the invention, as claimed.

#### SUMMARY OF THE INVENTION

[0013] The present invention is an extension apparatus for a vehicle tailgate. It includes a U-frame member, which is slidably extendable from an interior portion of the

vehicle tailgate; and it also includes a plurality of side braces adapted to lock said U-frame member in a plurality of operative positions.

In another aspect, the present invention is a method for utilizing a tailgate extension apparatus. The method includes the steps of opening a vehicle tailgate into a substantially horizontal position, extending a U-frame member from a storage position within said tailgate to a position outside of the tailgate; and locking said U-frame member into one of three operative positions by means of two side braces which accommodate all positions.

#### BRIEF DESCRIPTION OF THE DRAWINGS

[0014] For the present invention to be clearly understood and readily practiced, the present invention will be described in conjunction with the following figures, wherein like reference characters designate the same or similar elements, which figures are incorporated into and constitute a part of the specification, wherein:

[0015] Figure 1 is a schematic view of a pickup truck from the rear with the tailgate in a locked vertical position;

[0016] Figure 2 is a schematic view of the tailgate extension apparatus stored within a tailgate which is in the open position;

[0017] Figure 3 is a schematic view of the tailgate extension apparatus pulled out from within the tailgate with hinges attached thereto and with side braces shown hanging from the sidearms of the tailgate extension apparatus;

[0018] Figure 4 is a schematic top view of the tailgate extension showing side braces stored within the side arms of the tailgate extension.

[0019] Figure 5 is a schematic showing the non-rotating portion of a hinge including a depression for engaging a detent;

[0020] Figure 6 is a schematic view of the tailgate extension apparatus in the extension position;

[0021] Figure 7 is a schematic view of the tailgate extension apparatus in the backstop position;

[0022] Figure 8 is a schematic view of the tailgate extension apparatus in the step position;

[0023] Figure 9 is a schematic cross section showing a channel in the reinforcing module, the channel being for a sidearm of the tailgate extension;

[0024] Figure 10 is a schematic cross section showing a wire from the tailgate handle to one of the tailgate latches;

[0025] Figure 11 is a schematic showing the tailgate extension in the backstop position and an optional cover plate;

[0026] Figure 12 is a schematic cross section of the step portion of the tailgate extension, indicated as 12-12 in Fig.8, the step portion having a knurled surface; and

[0027] Figure 13 is a schematic cross section of the step portion of the tailgate extension, similar to Fig.12, the step portion having a pad.

## DETAILED DESCRIPTION OF THE INVENTION

**[0028]** It is to be understood that the figures and descriptions of the present invention have been simplified to illustrate elements that are relevant for a clear understanding of the invention, while eliminating, for purposes of clarity, other elements that may be well known. Those of ordinary skill in the art will recognize that other elements are desirable and/or required in order to implement the present invention. However, because such elements are well known in the art, and because they do not facilitate a better understanding of the present invention, a discussion of such elements is not provided herein. The detailed description will be provided hereinbelow with reference to the attached drawings.

**[0029]** In accordance with the present invention, a tailgate extension apparatus is provided that is capable of functioning in conjunction with a conventional tailgate (Fig. 1) to add the functionality of three additional positions (Figs. 6, 7, and 8). Initially referring to Fig. 1 of the drawings, a tailgate extension apparatus is incorporated in a vehicle 20 with a drop down tailgate 100. Handle 110 is for releasing latches (discussed later) which enable tailgate 100 to drop down to a horizontal position. Although the vehicle 20 shown in Fig. 1 is a pick-up truck, the invention may be used with many different kinds of cargo-carrying vehicles. The tailgate 100 is preferably a hybrid tailgate (described below) comprised of a plastic inner structural module (reinforcing module) surrounded by a thin

metal skin, but the present invention may also be used with a conventional hollow steel tailgate. When in its Fig. 1 stored position, the tailgate extension apparatus can not be seen, except along the top edge of the tailgate 100.

[0030] Fig. 2 schematically illustrates the tailgate 100 in its horizontal position, and Figure 3 shows the tailgate extension apparatus 200 pulled out from its storage position inside tailgate 100. The tailgate extension apparatus 200 generally comprises: two side arms 282, a step portion 280, two side braces 310 that are removably attached to the side arms 282, and a plurality of hinges having non-rotating portions 250 and rotating portions 286. These are for enabling pivoting of the extended tailgate extension apparatus 200 between a plurality of operative positions. All of these components of the tailgate extension apparatus 200 are retractably mounted within the tailgate 100, as indicated by dotted lines in Fig. 2. The operative positions preferably include a tailgate extension position (Fig.6), a tailgate backstop position (Fig. 7) and a step position (Fig.8).

[0031] Preferably, the sidearms 282 and step 280 of tailgate extension apparatus 200 are integrally formed as a U-frame member 205. Preferably, U-frame member 205 is formed of of extruded metal tubing, preferably aluminum or steel, but it could, alternatively, be made of a plastic, composite, or other material. Lighter materials are preferred to limit the overall weight of the tailgate and increase the ease with which the tailgate may be used.

[0032] Fig. 4 is a top view of the U-frame member 205 showing how side braces 310 are stored when the tailgate extension apparatus 200 is stored within tailgate 100.



The two side arms 282 of the tailgate extension 200 preferably include storage recesses 350 into which the side braces 310 may be stored when the tailgate extension apparatus 200 is not in use. The recesses 350 are in the outwardly facing sides of the side arms 282. Each recess 350 preferably also includes a hole 360 (best seen in Fig. 3) through which the locking post 320 of side brace 310 may be inserted. Each recess preferably also includes a hole 365 for the offset portion 330 of the side brace 310. A through hole 370 in the inwardly facing sides of the side arms 282 is also provided for the offset portion 330 of the side brace 310.

[0033] Preferably, a threaded mechanical fastener 340, such as a cap screw, selectively prevents the side brace 310 from disengaging completely from the side arm 282. The side brace 310 may be retained in its storage position by a clip or other fastening device (not shown) that functions to hold the brace 310 in place yet also releases it from the sidearm 282 when adequate lateral pressure is applied to the brace.

[0034] The U-frame member 205, preferably, has various cross-sections at different parts (such as rectangular, round, oval or otherwise shaped in profile), with the appropriate cross-section profile being chosen for the purpose that any particular area of the member is intended to serve.

[0035] In a presently preferred embodiment, the U-frame member 205 is a hollow extruded aluminum tube that has a circular or oval profile upon extrusion. The tube may then be hydroformed to impart the angles necessary to create the step 280, the recesses 350 for the side braces 310, and other features. The step 280 itself may have a more

"flattened" profile such as an oval or "C" shape so that the upper portion of the step (when the U-frame 205 is in the step position) provides a broad, flat surface area upon which a user can step. In additional embodiments, the various segments (*e.g.*, 280, 282) of the U-frame member 205 may be manufactured separately, and then brought together before being installed into the tailgate. Many different variations on this theme are envisioned within the scope of the invention.

[0036] The tailgate 100 preferably includes two hollow slots or channels 170 that serve to house and guide the arms 282 of the tailgate extension 200. Figure 3 defines two sections, 9-9 and 10-10. The former section is shown in Fig. 9 and the latter is shown in Fig. 10. Channels 170, which are visible in Figs 9 and 10 guide the tailgate extension 200 to move from its stored position (Fig. 2) to its extended (operative) positions (Figs. 6, 7, and 8).

[0037] Referring to Figs. 9 and 10, the inner portion 172 of channel 170 is provided to accommodate the offset portion 330 of side brace 310 as the tailgate extension 200 is moved between its stored position, as shown in Fig. 2 to its extended position, as shown in Fig. 3. Figures 9 and 10 show the structure of the hybrid tailgate. The upper metal skin 190 and the lower metal skin 195 are shown, above and below the reinforcing module 175, respectively.

[0038] Figure 10 shows a wire 186 which connects the tailgate handle 110 to one of the tailgate latches 180. A similar wire(not shown) connects the tailgate handle 110 to the opposite latch. The latches 180 capture posts on the vehicle 20 when the tailgate is in

the raised position shown in Figure 1. Release of the latches 180 permits the tailgate to be lowered to the position shown in Figs. 2 and 3. Following conventional practice, the latches 180, preferably, are spring loaded to the closed position. When handle 110 is pulled, opening forces are applied to the latches 180 through wires 186. Wires 186 pass through transverse slots 176 in reinforcing module 175.

[0039] The present invention is preferably incorporated into a so-called "hybrid" tailgate but may also be used with an adapted conventional tailgate. A conventional tailgate is typically manufactured by forming a flat sheet of steel into the shape of a tailgate and thereafter welding the edges together. These tailgates are heavy to work with, and alternative solutions are continually sought.

[0040] A hybrid tailgate, on the other hand, includes an interior reinforcing module of plastic or other lightweight material that is formed as the framework of the tailgate. A thin sheet of metal, such as aluminum, is then assembled around the outside of this reinforcing member. The plastic/aluminum (or other) combination may be as strong as a conventional steel tailgate but is lighter and easier to work with. The general structure of a hybrid tailgate is disclosed, for example, in U.S. Patent No. 5,944,373 which issued on August 31, 1999, and which is incorporated herein by reference in its entirety.

[0041] With a conventional tailgate, the channels 170 that guide and store the arms 282 of the U-frame member 205 may have to be specifically formed within the tailgate. With the preferred hybrid tailgate, however, the channels 170 may be made by hollowing out part of the plastic reinforcing member that makes up the interior of the hybrid tailgate

structure. Because the plastic reinforcing member already exists within the hybrid tailgate and further because plastic is an easier material to shape (mold) than steel, creating the channels 170 in the hybrid tailgate is preferred.

[0042] As best shown in Figs 4 and 5, hinge elements having non-rotating portions 250 and rotating portions 286 are preferably positioned on the ends of the U-frame arms 282 and serve to pivotably mount the tailgate extension 200 to the vehicle tailgate 100. Each hinge non-rotating portion 250 includes a depression 253. The depression 253 serves to lock the U-frame member 205 into a closed position for storage by way of a spring-loaded detent 156 within the tailgate.

[0043] Each hinge non-rotating portion 250 preferably includes a pair of pin engaging portions 252. A pin (not shown) attaches the hinge rotating portion 286 to the hinge non-rotating portion 250. Relative rotation occurs about axis 251 of the hinge non-rotating portion 250. Such a design allows the U-frame member 205 to rotate almost 180 degrees about the non-rotating portion 250 when the U-frame member 205 is fully extended from the tailgate 100. Thus, the U-frame member can be moved from the step position (Fig.8) to the extension position (Fig.6) or to the backstop position (Fig.7).

[0044] A spring-loaded detent 156 (shown schematically as a hidden block in the drawings) is located adjacent each channel 170. The spring loaded detent 156 engages depression 253 on hinge non-rotating portion 250 to retain the tailgate extension 200 in the stored position inside the tailgate (Fig.2).

**[0045]** Additionally, there is a stop 158 (shown schematically as a hidden block in the drawings). Preferably, stop 158 engages the hinge non-rotating portion 250 to prevent the tailgate extension from being completely removed from the tailgate 100. The stop 158 may, for example only, operate by engaging depression 253 on hinge non-rotating portion 250.

**[0046]** The locking posts 320 on the side braces 310 are for engaging the tailgate latches 180 (schematically indicated in block form in the drawings). When the tailgate extension 200 is in the backstop position, shown in Fig. 7, or the step position, shown in Fig.8, and the locking posts 320 on the side braces 310 are engaged with the tailgate latches 180, the side braces 310 become diagonal braces which provide rigid positioning of the tailgate extension 200. Rigid positioning of the tailgate extension 200 in the backstop position shown in Fig.7 and the step position shown in Fig.8 involves cooperation of the braces 310 and the stops 158.

**[0047]** To realize the step position, the tailgate 100 is first opened by moving it from a vertical position (Fig. 1) to a horizontal position (Fig. 2). The U-frame member 205 is then disengaged from the stored position by disengaging the detent 156 (by pressing a release button and/or pulling the U-frame out of the tailgate 100) and extending the U-frame from the tailgate until the stop 158 engages the hinge non-rotating portion 250. The braces 310 may then be released from the arms 282 of the U-frame member 205. This may be accomplished by withdrawing each brace 310 laterally from a clip in the side of the U-frame member 205. The U-frame member 205 may then be

pivoted downward until it is possible to engage the locking posts 320 located on the side braces 310 with the tailgate latches 180 located on the sides of the tailgate 100.

[0048] At this point the U-frame 205 is locked in position, and the U-frame can be used as a step (Fig. 8). In one embodiment of the invention, the step portion 280 of the U-frame member 205 is grooved or knurled in a manner such that traction will be enhanced. Fig. 8 shows the tailgate extension 200 in the step position, and defines a cross section, 12-12. Fig.12 shows this cross section, and it shows the knurled surface 290 of the step 280. In another embodiment, shown in Fig.13, a pad 295 may be applied to the step 280 to aid in user traction.

[0049] To release the U-frame member 205 from this step position, the braces 310 are disengaged from the tailgate latches 180, preferentially, by pulling the handle 110 on the tailgate 100 and pulling in an upward direction on the side braces 310. The side braces 310 may then be placed in their storage positions in the recesses 350 in the arms 282 of the U-frame member 205. The U-frame member 205 may then be returned to a horizontal position and reinserted into the tailgate by and sliding the U-frame member 205 into the tailgate until the detent 156 engages.

[0050] Another potential use of the invention is when the U-frame member 205 is in the tailgate extension position (Fig. 6). This position allows for the hauling of oversized loads, much like a flatbed truck, but with more support for the cargo than with a conventional tailgate. In this position, the U-frame member 205 is extended horizontally from an open tailgate 100, thereby increasing the effective length of the tailgate.

**[0051]** To realize this position, the tailgate 100 is first opened by moving it from a vertical position (Fig. 1) to a horizontal position (Fig. 2). The U-frame member 205 is then disengaged from the stored position by disengaging the detents 156 and extending the U-frame from the tailgate 100 until the locking posts 320 on the side braces 310 can be captured by the tailgate latches 180, as shown. In this position, the side braces 310 are substantially parallel to the arms 282 of the U-frame 205, and the side braces 310 prevent the tailgate extension 200 from being pulled fully out, so the channels 170 in the reinforcing module 175 prevent the U-frame member 205 from rotating downward.

**[0052]** At this point, the U-frame member 205 is locked in position and the U-frame can function as an extension of the existing tailgate 100 (Fig. 6). To release the U-frame member 205 from this position, the braces 310 are removed from the latch mechanism 242 in the tailgate by pulling the handle 110 on the tailgate 100. They are then replaced in their storage positions, within the recesses 350 of the U-frame arms 282. The U-frame member 205 may then be reinserted into the tailgate 100 by sliding it into the tailgate until the detent 156 engages.

**[0053]** The present invention may also be used with the U-frame member 205 in the backstop position (Fig. 7). This position allows for the hauling of oversized loads that may potentially fall out of the bed when the tailgate 100 is in a horizontal position.

**[0054]** To place the U-frame member 205 in the backstop position, the tailgate 100 is first opened by moving it from a vertical position (Fig. 1) to a horizontal position (Fig. 2). The tailgate extension 200 is then pulled fully out until the stops 158 prevent further

movement. This is the configuration shown in Fig. 3. The U-frame member 205 is then rotated upwardly to the vertical position shown in Figure 7. The side braces 310 are then attached by inserting the locking posts 320 into the tailgate latches 180. In that configuration, the side braces 310 act as diagonal braces which prevent rotation of the U-frame member. The U-frame member 205 then acts as a backstop, preventing the accidental discharge of loads. Cargo may be lashed to the U-frame member 205.

[0055] To release the U-frame member 205 from this position, the braces 310 are removed from the tailgate latch mechanism 180 in the tailgate 100 and replaced in their storage positions in the side arms 282 of the U-frame. The U-frame member 205 may then be returned to a horizontal position and reinserted into the tailgate 100 by sliding the U-frame into the tailgate until the detent 156 engages.

[0056] In order for the side braces 310 to place the U-frame member 205 in a vertical position for use as a backstop, or a slanting position for use as a step, the hole 365 for the offset portion 330 of side brace 310 may be placed below the axis of rotation 251 of the hinge non-rotating portion 250. Also, the tailgate latch 180 is preferably designed so that when locking post 320 is engaged with the latch, the locking post 320 is also below axis of rotation 251.

[0057] Although the above description details the general structure and use of the present invention, there may also be additional features that can be used with the tailgate extension apparatus. For example, when the tailgate extension is used in the backstop or extension position, the extension is acting as a body panel but only comprises a U-frame.



Therefore, there is a large amount of space within the U-frame through which certain types of cargo could fall out of the vehicle.

[0058] Therefore, as shown in Fig. 11, one preferred addition to the above tailgate extension apparatus includes a removable cover plate 400 that can be snapped or otherwise attached to the U-frame when necessary. The cover plate 400 may be a thin sheet of plastic, metal, leather, or any other suitable material. Preferably, the additional cover plate 400 is a thin solid sheet that can be attached to the surface of the tailgate that faces the interior of the truck bed or other cargo space. The plate 400 may be attached with a plurality of snaps, bolts, or any other fasteners. When needed, the plate 400 is simply removed from the tailgate and attached to the U-frame member. Once attached, the plate 400 will provide the support of a regular body panel.

[0059] It is preferred that the cover plate 400 be attached by hinges 410 to the conventional tailgate at the upper portion of the interior face of the tailgate. When the tailgate is opened and the tailgate extension apparatus is extended and locked into place as a backstop or extension, this additional plate 400 can be rotated on the hinges and swung against the U-frame which will be at a 90 degree (backstop) or 180 degree (extension) orientation from the open tailgate. Once swung into position, the cover plate 400 can be secured to the U-frame 205 with snaps or any other fastening mechanism. It is noted that cover plate 400 is not stored within the tailgate 100, but lies against the top surface of the tailgate when the tailgate is down, which is the inner surface of the tailgate when the tailgate is up.

**[0060]** When the tailgate extension 200 is employed as a step, the cover plate 400 may be rotated to a position on the tailgate 100 so it does not interfere with step 280.

**[0061]** Nothing in the above description is meant to limit the present invention to any specific materials, geometry, or orientation of elements. Many part/orientation substitutions are contemplated within the scope of the present invention and will be apparent to those skilled in the art. The embodiments described herein were presented by way of example only and should not be used to limit the scope of the invention.

**[0062]** Although the invention has been described in terms of particular embodiments in an application, one of ordinary skill in the art, in light of the teachings herein, can generate additional embodiments and modifications without departing from the spirit of, or exceeding the scope of, the claimed invention. Accordingly, it is understood that the drawings and the descriptions herein are proffered only to facilitate comprehension of the invention and should not be construed to limit the scope thereof.